

WHAT IS CLAIMED IS:

1           1.     A system for providing a bi-directional data communications channel having a  
2     user data channel and a back channel within each direction of the bi-directional data  
3     communications channel, the system comprising:

4           at least two transmitter modules, one transmitter module for each direction of the bi-  
5     directional data communications channel, each of the transmitter modules encode a user  
6     data stream and back channel data stream into a coded data stream and transmit the  
7     coded data stream through the communications channel; and

8           at least two receiver modules, one receiver module for each direction of the bi-  
9     directional data communications channel, each of the receiver modules receive the coded  
10    data stream transmitted through the data channel and decodes the coded data stream into  
11    the user data stream and the back channel data stream.

1           2.     The system according to claim 1 wherein the user data stream includes at  
2     least one user data word that corresponds to a plurality of coded representations wherein  
3     each of the coded representations represents a symbol of the back channel data stream,  
4     and wherein each receiver module, upon receiving at least one of the plurality of coded  
5     representations that represents back channel information, decodes the coded  
6     representation into the user data word for the user data channel and into the symbol for the  
7     back channel data stream.

1           3.     The system according to claim 2, wherein the back channel data is  
2     transmitted as a serial stream of symbols within a data frame.

1           4.     The system according to claim 3, wherein the back channel data comprises  
2     channel performance information to allow continuous or periodic adaption of operation of  
3     the communications channel.

1           5.     The system according to claim 3 where the communications channel includes  
2     a backplane.

1           6.     The system according to claim 3 where the communications channel includes  
2     a cable.

1           7.     The system according to claim 2, wherein a second plurality of code words  
2     that correspond to back channel information is incorporated into the coded, transmitted  
3     data stream when back channel data symbols have not been transmitted within a pre-  
4     defined amount of time to ensure a minimum back channel data rate

1           8.     The system according to claim 7, wherein each receiver module, upon  
2     receiving one of the plurality of code words that represents back channel information,  
3     decodes for the back channel data stream.

1            9.     The system according to claim 2, wherein the back channel is used to  
2     establish a control channel to a far-end module of a link and wherein the back channel is  
3     controlled by a near-end module.

1            10.    The system according to claim 2, wherein the back channel is used to provide  
2     additional channel bandwidth that may be mapped to another communications channel.